WHAT IS CLAIMED IS:

1. A hydrogen sensor comprising:

a) a dielectric surface material; and

b) at least one metal nanowire comprising Pd and Ag on said dielectric surface, wherein said metal nanowire comprises at least one nanobreakjunction which closes when exposed to a threshold hydrogen concentration.

2. The hydrogen sensor of claim 1, further comprising electrodes in contact with said metal nanowire.

3. The hydrogen sensor of claim 2, further comprising a power supply connected to said electrodes so as to form a circuit.

4. The hydrogen sensor of claim 3, further comprising a device for measuring one or more electrical properties of said metal nanoparticles within said circuit.

5. The hydrogen sensor of claim 1, wherein solvation of hydrogen in the metal nanowire effects an electrical response at some threshold concentration by closing said nanobreakjunctions.

6. The hydrogen sensor of claim 5, wherein said electrical response is selected from the group consisting of a change in resistivity, a change in conductivity, a change in capacitance, a change in conductivity, and combinations thereof.

7. The hydrogen sensor of claim 1, wherein the Ag content ranges from about 0 percent to about 26 percent.

8. The hydrogen sensor of claim 1, wherein multiple metal nanowires within said sensor comprise varying compositions so as to enable the detection of a range of hydrogen concentrations over a range of temperatures.

9. The hydrogen sensor of claim 1, wherein said sensor provides for detection of hydrogen in transformers.

10. A hydrogen sensor comprising:

a) a dielectric surface material; and

b) one or more columns of metal nanoparticles on said surface, wherein nanogaps between the nanoparticles close when exposed to a threshold hydrogen concentration.

11. The hydrogen sensor of claim 10, wherein closure of said nanogaps effects a detectable electronic response along the column of nanoparticles when said column is incorporated into an electrical circuit.

12. The hydrogen sensor of claim 11, wherein said electrical response is selected from the group consisting of a change in resistivity, a change in conductivity, a change in capacitance, a change in conductivity, and combinations thereof.

13. The hydrogen sensor of claim 11, wherein said metal nanoparticles comprise Pd.

14. The hydrogen sensor of claim 11, wherein said metal nanoparticles comprise alloys of Pd and Ag.

15. The hydrogen sensor of claim 14, wherein multiple columns of metal nanoparticles comprise varying ratios of Pd and Ag so as to effect the detection of hydrogen over a range of concentrations with the same device.

16. The hydrogen sensor of claim 11, wherein said sensor provides for detection of hydrogen in transformers.

17. A method comprising the steps of:

a) forming at least one precisely-defined metal-alloy nanowire comprising nanobreakjunctions which close when exposed to predefined threshold concentrations of hydrogen;

b) forming a circuit comprising said nanowire; and

c) monitoring an electrical property within said circuit so as to determine when said nanobreakjunctions close.

18. The method of claim 17, wherein the nanowire comprises Pd and Ag.

19. The method of claim 17, wherein the metal nanowires have a composition that can be tailored so as to effect nanobreakjunction closure at varying concentrations of hydrogen.

20. The method of claim 17, wherein said method provides for hydrogen detection in transformers.